LAWRENCE LIVERMORE
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Feb. 28-March 4, 2011

Dirty bomb vs. nuclear weapon

Former Lab physicist Tom Reed, author of "The Nuclear Express," recently appeared on Fox News to explain the difference between a dirty bomb and a nuclear weapon and how likely terrorists could get their hands on either.

While both devices contain radioactive material, they are quite different, Reed explains. A dirty bomb is a "serious inconvenience" that contains radioactive materials packed around explosives, which when donated, could potentially kill hundreds of people.

However, a nuclear weapon needs enriched uranium that could be bought in Pakistan, North Korea, the Russian black market or elsewhere and the resulting detonation would kill thousands to millions.

On whether a nuclear attack in the United States is likely, Reed says, "Chances of a nuclear attack on the United States is low because we are doing the right thing. The probabilities are low but the consequences are enormously high."

To see the full interview, go to the Web.

Check your head

LLNL researcher John Chang tests a prototype intracranial hematoma detector on a human skull.

A non-invasive and continuous real-time intracranial hematoma detector is one of two awards LLNL has won for technology transfer from the Federal Laboratory Consortium.

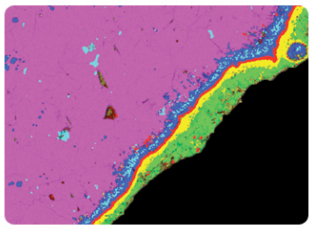
The other award goes to a Livermore team that developed a key component of a robotic biochemistry lab that can be placed in the ocean to conduct analysis.

The hematoma detector is a prototype that would be an automated, unattended, portable, non-invasive, continuous real-time monitoring device that detects the presence and expansion of an intracranial hemorrhage.

An Environmental Sample Processor (ESP), developed by the Monterey Bay Aquarium Research Institute (MBARI) in conjunction with the Laboratory, is a robotic biochemistry lab that can be placed in the ocean to analyze genetic material or other organic compounds created by microorganisms in seawater. After performing these analyses, the ESP can send the results back to shore in real time.

To read more, go to the Web.

One wild ride



Compositional X-ray image of the rim and margin of an approximately 4.6 billion year old calcium aluminum refractory inclusion (CAI) from the Allende meteorite.

Livermore scientists have found that calcium, aluminum-rich inclusions (CAIs), some of the oldest objects in the solar system, formed far away from our sun and then later fell back into the mid-plane of the solar system.

The findings may lead to a greater understanding of how our solar system and possibly other solar systems formed and evolved.

CAIs, roughly millimeter- to centimeter in size, are believed to have formed very early in the evolution of the solar system and had contact with nebular gas, either as solid condensates or as molten droplets. Relative to planetary materials, CAIs are enriched with the lightest oxygen isotope and are believed to record the oxygen composition of solar nebular gas where they grew. CAIs, at 4.57 billion years old, are millions of years older than more modern objects in the solar system, such as planets, which formed about 10-50 million years after CAIs.

The team studied a specific CAI found in a piece of the Allende meteorite. Allende is the largest carbonaceous chondrite meteorite ever found on Earth. It fell to the ground in 1969 over the Mexican state of Chihuahua and is notable for possessing abundant CAIs.

To read more, go to the Web.

Less like ketchup

At left, highly turbulent behavior as water flows into (clear) oil. At right, all turbulence is suppressed by using cornstarch.

Changing a mud recipe to behave more like quicksand and less like ketchup could help plug a spewing oil well quicker than the typical top-kill procedure.

Research by Laboratory scientists in collaboration with a Washington University researcher suggests that a new "mud recipe" using materials such as cornstarch to create a more viscous formula for plugging up a spewing oil well might just work in the future.

In May 2010, BP started a top-kill procedure, in which it would pump heavy mud down the wellbore in an attempt to stop the oil flow coming out of the Macondo well in the Gulf of Mexico. It would take three months before the oil spill was stopped in July by capping the gushing oil head.

The top-kill method is much like ketchup -- a shear-thinning fluid -- which first resists flow and begins to flow quickly only when it is stressed by shaking or by squeezing the bottle.

To suppress instability, the mud needed to be a shear-thickening rather than a shear-thinning fluid -- like quicksand. When you fall into quicksand, it is important to move slowly. The faster you move, the more the quicksand resists your movement.

To read more, go to the Web.

Exploring the endless possibilities

Jenny Aquilino, of LLNL guides girls in reassembling a computer hard drive during the "PC Maintenance and Repair workshop at EYH."

More than 300 girls descended on San Ramon last weekend for the Tri-Valley Expanding Your Horizons career conference with the theme of "Learn -- Explore -- Experience -- Dream."

At the conference, girls in grades six through nine were part of more than a dozen hands-on workshops that covered a wide range of topics, including: environmental geology, fingerprinting, DNA, chemistry, veterinary medicine, computers and robotics.

A career fair was held during the noon hour that provided opportunities to meet role-models -- scientists, engineers and representatives from local companies and organizations -- and learn more about their careers.

Organizing sponsors of the 32nd Tri-Valley EYH included Sandia National Laboratories/California, Lawrence Livermore National Security, Diablo Valley College, San Ramon Campus and the American Association of University Women.

To watch a video of the day's events, visit the Web.
